Safer Alternatives To Traditional Cadaver Embalming

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Abstract

The most common component of embalming fluid is formaldehyde, as it is extremely efficient at preserving tissue; unfortunately, formaldehyde is an extremely hazardous, carcinogenic chemical. Three alternative methods of embalming were investigated based on each method's associated health hazards and quality of preservation. It was found that while the Thiel method of embalming produces the highest quality specimen, the nitrite pickling salt method was the most effective alternative to formaldehyde embalming, producing a quality specimen without compromising safety.

Internship Site

The Maryland State Anatomy Board is a part of the University of Maryland School of Medicine. The Anatomy Board prepares donated bodies to be used for scientific purposes, most often for medical student and medical professional use, honing their skills.

Job Description and Outcomes

I observed and assisted with daily duties necessary to support the functioning of the Anatomy Board. The duties performed include:

- Paperwork
- Maneuvering bodies
- Locating and raising arteries/veins
- Setting up cadavers for use in classes
- Boxing cadavers for cremation
- Cleaning surgical equipment
- Taking blood samples
- Performing arterial flushes
- Suturing incisions
- Embalming cadavers

Background

Embalming is the act of preserving a cadaver through the use of natural or artificial materials. [1] The act of preserving the dead has been around for thousands of years, with the earliest known form of artificial preservation having been performed by members of the Chinchorro culture around 6000-5000 BC. [2] The most notorious embalmers in history, the Egyptians, were very particular about their mortuary practices, as the Egyptians believed in the afterlife; the Egyptians also believed that the preparation of the body was crucial in determining the survival of the deceased individual in the afterlife. [3] Recently, Dr. Bob Brier and Mr. Ronn Wade successfully replicated the postulated method used by the Egyptians to preserve bodies; a method that had not been utilized for over 2,000 years as there is no written record of it. [4,5]

While the Egyptians used materials such as natron to desiccate and ultimately preserve bodies, modern embalmers commonly use chemicals such as formaldehyde, which preserve the body by making the tissues indigestible by bacteria. [5,6,7]

Unfortunately, formaldehyde is a health concern due to studies associating it with the development of various cancers and other disorders. Formaldehyde has been associated with:

- Myeloid Leukemia [8,10,11,12,13]
- Nasal sinus cancers [9]
- Increased rate of chromosomal aberrations in peripheral lymphocytes [12,14]
- Increased rate of apoptosis in peripheral lymphocytes [12,14]
- Amyotrophic lateral sclerosis [15]

It is unethical and immoral to knowingly expose workers to materials that could be causing bodily harm.

This poster will compare three alternative methods of embalming, as well as traditional formaldehyde embalming, in order to identify a method of embalming that poses a lesser threat to health than that of formaldehyde embalming.

Current Issue

Table 1: Comparison of health hazards associated with different embalming methods
Data obtained from Material Safety Data Sheets. Red signifies hazardous.

Material	Toxic	Mutagenic	Carcinogenic	Irritant	Corrosive	Sensitizer
Formaldehyde Method [16,17]						
Formaldehyde	Yes	Yes	Yes	Yes	Yes	Yes
Phenol	Yes	No	No	Yes	Yes	Yes
Glycerin	No	No	No	Yes	No	No
Thiel Method [18,19]						
Boric Acid	Yes	No	No	Yes	No	No
Propylene-glycol	No	Yes	No	Yes	No	Yes
Ammonium Nitrite	No	No	No	No	No	No
Potassium Nitrate	Yes	Yes	No	Yes	No	No
4-Chloro-3-Methylphenol	Yes	No	No	Yes	Yes	Yes
Sodium Sulphite	Yes	Yes	No	Yes	No	Yes
Morpholine	Yes	No	No	Yes	Yes	No
Formaldehyde	Yes	Yes	Yes	Yes	Yes	Yes
Ethanol	Yes	Yes	No	Yes	No	No
Nitrite Pickling Salt Method [20]						
Sodium Nitrite	Yes	Yes	No	Yes	No	No
Ethanol	Yes	Yes	No	Yes	No	No
Pluriol	No	No	No	Yes	No	No
Oregano oil	No	No	No	Yes	No	Yes
Ethanol-Glycerin Method [21,22]						
Ethanol	Yes	Yes	No	Yes	No	No
Glycerin	No	No	No	Yes	No	No
Thymol	Yes	No	No	Yes	No	No
Formaldehyde	Yes	Yes	Yes	Yes	Yes	Yes

Table 2: Comparison of embalming methods by the cost and space necessary for each, the realism of embalmed cadavers, and hazardousness of each method.
Each symbol signifies an increased unit of the respective category

	Cost	Space Needed	Realism of Cadaver	Hazardousness
Formaldehyde [16,17, 25]	$	X	♥	☠☠☠
Thiel [18-22, 24, 25]	$$$	XXX	♥♥♥	☠☠☠☠
Nitrite Pickling Salt [20]	$	XX	♥♥	☠
Ethanol-Glycerin [21,22]	$$	XX	♥	☠☠

Current Issue

Additional Considerations

Formaldehyde Method

✓ Viable for certain histological preservations [23]
✗ Microbial growth occurs after initial embalming [20]

Nitrite Pickling Salt Method

✗ Has not been performed on human cadavers yet [20]
✗ Requires body cavity to be open during embalming process [20]

Ethanol-Glycerin Method

✗ Requires an explosion-proof room for embalming[21,22]

Issue Recommendations

- Investigate nitrite pickling salt for use on human cadavers as a a safer alternative to traditional formaldehyde embalming.
- Avoid long periods of exposure to formaldehyde and formaldehyde-embalmed bodies.
- If utilizing the Thiel method of embalming, wear a gastight hazmat suit.

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